

**APPARATUS AND METHOD FOR SIGNALING AN
IMMINENT AUTO-EXPOSURE IN A DIGITAL CAMERA**

Robert G. DeMoor

1. Field of the Invention

5 This invention relates to digital cameras and, more particularly, to apparatus for capturing an improved image by a digital camera.

2. Background of the Invention

10

 The use of digital cameras has been increasing in the past few years. The conveniences of reviewing an image before committing the image to storage as well as the ability to download images over the internet are a 15 few of the features that are particularly attractive to camera operators.

Referring to Fig. 1, a diagram illustrating the components of a digital camera 10, according to the prior art, is shown. The operation of the digital camera can be understood as follows. A user activates switch 11 in 5 order to acquire a photographic image. The switch 11 applies an activation signal to processing unit 12. For a relatively simple digital camera, the processing unit 12 will provide the proper conditions for photo-sensitive region 15 to acquire an image, will activate the flash 10 assembly 13, and will activate the shutter assembly 14. Activation of the shutter assembly 14 will cause an optical image to be applied to the photo-sensitive region 15. After the image has been applied to the photo-sensitive region 15, the image is converted into logic 15 signals and is processed by the processing unit 12. In more complex systems, the external illumination level can be monitored and the processing unit 12 can control the time in which the photo sensitive region is illuminated by the subject. The digital camera further includes a 20 display 16. This display 16 is used to display an image captured by the digital camera 10, the image being displayed in response to the user input to the image select 18. After viewing, the user can then erase the image from the processing unit 12 or, if the image is 25 acceptable, store the image in the memory 12A associated with the processing unit 12 for later disposition.

In addition, a digital camera typically includes a mode select switch 19 to activate an auto-exposure of the image. The auto-exposure mode involves a delayed activation of the image acquisition, i.e., delayed 5 activation the shutter, the photo-sensitive surface, and the flash assembly. The purpose of the auto-exposure mode is to permit the operator of the camera to become part of the image by utilizing the delay in the image acquisition along with the auto-activation.

10

While the auto-exposure has been widely used feature, some problems have remained. In particular, the determination of the precise moment of activation has been problematic. The digital cameras in the past have 15 provided a flashing light to indicate when the auto-activation is about to take place. However, the flashing light has not proven satisfactory for permitting the subjects of an auto-exposure to anticipate when the image acquisition is about to take place.

20

A need has therefore been felt for apparatus and an associated method having the feature that the subjects whose image is to be captured in an auto-activation of a digital camera will be able to anticipate the moment of 25 activation. It would be a further feature of the apparatus and associated method to provide a count-down such that the moment of auto-activation of the camera

will be evident to the image subjects. It would be yet another feature of the apparatus and associated method to utilize the digital camera display to provide a sequence of images that are displayed periodically and that permit
5 the image subjects to anticipate the actual auto-acquisition of the image by a digital camera in the auto-exposure mode. It would be yet another feature of the apparatus and associated method to such that the last image of the sequence is displayed just prior to the
10 auto-exposure of the digital camera. It would be a more particular feature of the apparatus and associated method to permit the digital camera display to be positioned such that images displayed thereon are visible to the subject images.

15

Summary of the Invention

The aforementioned and other features are accomplished, according to the present invention, by
20 storing in the memory unit associated with the processing unit of the digital camera, a sequence of images. When the auto-exposure mode is activated on the digital camera, the sequence of images are withdrawn from the memory unit and applied periodically to the display. The
25 display is positioned to be visible to the image subjects. The sequence of images is timed to end just prior to the auto-activation. In addition, the images

are selected to be in an order permitting the image subjects to be able to anticipate the time of the auto-exposure.

5 Other features and advantages of the present invention will be more clearly understood upon reading of the following description and the accompanying drawings and claims.

10 **Brief Description of the Drawings**

Figure 1 is diagram of a digital camera according to the prior art.

15 Figure 2 is diagram of a digital camera according to the present invention.

Description of the Preferred Embodiment

20 **1. Detailed Description of the Drawings**

Fig. 1 has been described with respect to the related art.

25 Referring to Fig. 2, a diagram of the digital camera
20 according to the present invention is shown. In this embodiment of a digital camera, a sequence of images is

stored in a memory portion 12A associated with the processing unit 12. The image sequence is applied to display 16. Display 16 has been positioned to facing the image subject(s) 21. The sequence of images forms a
5 count-down sequence that permits the image subject(s) 21 in an auto-activation mode to anticipate the moment of automatic exposure. The number of images in the image sequence and the time between images are selected to permit the image subject to estimate, at the end of the
10 sequence, when the shutter will be activated and the image of the image subjects acquired.

2. Operation of the Preferred Embodiment

15 In the present invention, the image subjects of an automatic exposure mode of operation can determine relatively precisely when the exposure is activated. In the past, the moment of shutter activation has been difficult to ascertain. Image subjects frequently look
20 unprepared when the acquired image is processed. The present invention addresses this problem by providing an unambiguous count-down, culminating in shutter activation. For example, the image on the display may be a number count down, the exposure occurring the same time
25 period after the display of the number "1" as the time period between each of the sequence of images. The sequence of images can also be a sequence of color

images, the final color or color images indicating the imminent activation of the shutter. Or according to another embodiment of the sequence of images, the amounts of dark and bright area of the displayed images can 5 systematically varied provide an indication of impending shutter activation.

As will be clear, the delayed activation of the shutter and the time between each of the images of the 10 image sequence can be controlled by the clock of the processing unit.

While the invention has been described with respect to the embodiments set forth above, the invention is not necessarily limited to these embodiments. Accordingly, other embodiment variations, and improvements not described herein, are not necessarily excluded from the scope of the invention, the scope of the invention being defined by the following claims.